Exhibit C

AO 120 (Rev. 08/10)

TO:	REPORT ON THE FILING OR DETERMINATION OF AN ACTION REGARDING A PATENT OR TRADEMARK
Mail Stop 8 Director of the U.S. Patent and Trademark Office P.O. Box 1450 Alexandria, VA 22313-1450	

In Compliance with 35 U.S.C. § 290 and/or 15 U.S.C. § 1116 you are hereby advised that a court action has been filed in the U.S. District Court Eastern District of Texas, Marshall Division on the following

☐ Trademarks or ☑ Patents. (☐ the patent action involves 35 U.S.C. § 292.):

DOCKET NO.	DATE FILED	U.S. DISTRICT COURT
2:21-cv-00063	2/24/21	Eastern District of Texas, Marshall Division

PLAINTIFF	DEFENDANT
FINESSE WIRELESS LLC	AT&T MOBILITY LLC

	PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
1	7,346,134	3/18/2008	FINESSE WIRELESS LLC
2	9,548,775	1/17/2017	FINESSE WIRELESS LLC
3			
4			
5			

In the above—entitled case, the following patent(s)/ trademark(s) have been included:

DATE INCLUDED

INCLUDED BY ☐ Amendment ☐ Answer ☐ Cross Bill ☐ Other Pleading

	PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
1			
2			
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In the above—entitled case, the following decision has been rendered or judgement issued:

DECISION/JUDGEMENT

CLERK	(BY) DEPUTY CLERK	DATE

Copy 1—Upon initiation of action, mail this copy to Director **Copy 3—Upon termination of action, mail this copy to Director**
Copy 2—Upon filing document adding patent(s), mail this copy to Director **Copy 4—Case file copy**

AO 120 (Rev. 08/10)

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DOCKET NO.	DATE FILED	U.S. DISTRICT COURT
2:21-cv-00064	2/24/2021	Eastern District of Texas, Marshall Division

PLAINTIFF	DEFENDANT
FINESSE WIRELESS LLC	CELLCO PARTNERSHIP D/B/A VERIZON WIRELESS

	PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
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CLERK	(BY) DEPUTY CLERK	DATE

Copy 1—Upon initiation of action, mail this copy to Director **Copy 3—Upon termination of action, mail this copy to Director**
Copy 2—Upon filing document adding patent(s), mail this copy to Director **Copy 4—Case file copy**

Notice of Allowability	Application No. 12/851,510	Applicant(s) SMITH, FRANCIS J.	
	Examiner RUIMENG HU	Art Unit 2649	AIA (First Inventor to File) Status No

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☒ This communication is responsive to *8/18/2016*.
   ☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on_____.
2. ☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on _____; the restriction requirement and election have been incorporated into this action.
3. ☒ The allowed claim(s) is/are *65-70,72-91 and 93-106*. As a result of the allowed claim(s), you may be eligible to benefit from the **Patent Prosecution Highway** program at a participating intellectual property office for the corresponding application. For more information, please see http://www.uspto.gov/patents/init_events/pph/index.jsp or send an inquiry to PPHfeedback@uspto.gov.
4. ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

   Certified copies:

   a) ☐ All b) ☐ Some *c) ☐ None of the:
   1. ☐ Certified copies of the priority documents have been received.
   2. ☐ Certified copies of the priority documents have been received in Application No. _____ .
   3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

   * Certified copies not received: _____.

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.
THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.

5. ☐ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.
   ☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date _____.

   Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).
6. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

Attachment(s)

1. ☒ Notice of References Cited (PTO-892)
2. ☐ Information Disclosure Statements (PTO/SB/08), Paper No./Mail Date _____
3. ☐ Examiner's Comment Regarding Requirement for Deposit of Biological Material
4. ☒ Interview Summary (PTO-413), Paper No./Mail Date _____ .
5. ☒ Examiner's Amendment/Comment
6. ☒ Examiner's Statement of Reasons for Allowance
7. ☐ Other _____.

1. The present application is being examined under the pre-AIA first to invent provisions.

EXAMINER'S AMENDMENT

2. An examiner's amendment to the record appears below. Should the changes and/or additions be unacceptable to applicant, an amendment may be filed as provided by 37 CFR 1.312. To ensure consideration of such an amendment, it MUST be submitted no later than the payment of the issue fee.

Authorization for this examiner's amendment was given in a telephone interview with Michael Mallie on 08/26/2016.

The application has been amended as follows:

Claim 82. (Currently Amended) A method comprising: creating one or more composite passive intermodulation product (IMP) cancellation signals (ICS s) by digitally multiplying, sample by sample and in real and continuous time, a full passband of a composite digital transmitter signal set with one or more transmitter IMP cancellation signals (ICSs)**[, wherein generating the ICSs is based on a power series description of a non-linear process for generating the IMPs, and includes generating an n-th order ICS by, given three signals S1, S2 and S3, digitally multiplying and filtering S1 x S1 x S2 and S1 x S2 x S2 and S1 x S2 x S3 and S1 x S1 x S3 and S2 x S2 x S3 and S1 x S3 x S3 and S2 x S3 x S3, where n is an integer]**; and filtering the transmitter ICSs to selectively pass ICSs for passive IMP cancellation in a receiver, the receiver co-located with a transmitter, the passive IMP

cancellation to cancel passive IMPs generated after a high powered amplifier (HPA) and a transmitter filter of the transmitter, wherein the transmitter filter is coupled between the HPA and an antenna used by the transmitter**, wherein generating the ICSs is based on a power series description of a non-linear process for generating the IMPs, and includes generating an n-th order ICS by, given three signals S1, S2 and S3, digitally multiplying and filtering S1 x S1 x S2 and S1 x S2 x S2 and S1 x S2 x S3 and S1 x S1 x S3 and S2 x S2 x S3 and S1 x S3 x S3 and S2 x S3 x S3, where n is an integer**.

Claim 103. (Currently Amended) An apparatus comprising: a transmitter; a receiver co-located with the transmitter; and circuitry configured to: create one or more composite passive intermodulation product (IMP) cancellation signals (ICSs) by digitally multiplying, sample by sample and in real and continuous time, a full passband of a composite digital transmitter signal set with one or more transmitter IMP cancellation signals (ICSs)**[, wherein the ICSs are generated based on a power series description of a non-linear process for generating the IMPs, and a 3rd order ICS is generated by, given three signals S1, S2 and S3, digitally multiplying and filtering S1 x S1 x S2 and S1 x S2 x S2 and S1 x S2 x S3 and S1 x S1 x S3 and S2 x S2 x S3 and S1 x S3 x S3 and S2 x S3 x S3]**; and filter the transmitter ICSs to selectively pass ICSs for passive IMP cancellation in a co-located receiver, the passive IMP cancellation to cancel passive IMPs generated after a high powered amplifier (HPA) and a transmitter filter of the transmitter, wherein the transmitter filter is coupled between the HPA and an antenna used by

the transmitter**, wherein the ICSs are generated based on a power series description of a non-linear process for generating the IMPs, and a 3rd order ICS is generated by, given three signals S1, S2 and S3, digitally multiplying and filtering S1 x S1 x S2 and S1 x S2 x S2 and S1 x S2 x S3 and S1 x S1 x S3 and S2 x S2 x S3 and S1 x S3 x S3 and S2 x S3 x S3**.

Allowable Subject Matter

3. **Claims 65-70, 72-91 and 93-106** are allowed.

4. The following is an examiner's statement of reasons for allowance:

Consider **claims 65, 68, 81, 82, 86, 89, 102 and 103**, the best prior art of record found during the examination of the present application, **Filipovic et al. (US Patent 7,876,867) in view of Lackey (US Pub 2010/0136925) and Dent (US Patent 8,855,580)** fail to specifically disclose wherein generating the ICSs is based on a power series description of a non-linear process for generating the IMPs, and includes generating an n-th order ICS by, given three signals S1, S2 and S3, digitally multiplying and filtering S1 x S1 x S2 and S1 x S2 x S2 and S1 x S2 x S3 and S1 x S1 x S3 and S2 x S2 x S3 and S1 x S3 x S3 and S2 x S3 x S3.

Therefore, claims 65-70, 72-91 and 93-106 of the present application are considered novel and non-obvious over the prior art and, consequently, are allowed.

Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably

accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

Conclusion

Any response to this Office Action should be **faxed to** (571) 273-8300, **submitted online** via the USPTO's Electronic Filing System-Web (EFS-Web) (Registered eFilers only, Registered users of the USPTO's EFS-Web system may submit a response electronically through EFS-Web at https://efs.uspto.gov/TruePassSample/AuthenticateUserLocalEPF.html), **or mailed to:**

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Hand-delivered responses should be brought to

Customer Service Window
Randolph Building
401 Dulany Street
Alexandria, VA 22314

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Rui Meng Hu whose telephone number is 571-270-1105. The examiner can normally be reached on Monday - Thursday, 8:00 a.m. - 5:00 p.m., EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Edward Urban can be reached on 571-272-7899. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

/Rui Meng Hu/
R.H./rh
August 26, 2016

/Edward Urban/

Supervisory Patent Examiner, Art Unit 2649

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:
Francis J. Smith

Application No.: 12/851,510

Filed: August 5, 2010

Attorney Docket No.: 5859P008X

For: **MITIGATION OF TRANSMITTER PASSIVE AND ACTIVE INTERMODULATION PRODUCTS IN REAL AND CONTINUOUS TIME IN THE TRANSMITTER AND CO-LOCATED RECEIVER**

Examiner: Rui Meng Hu

Art Unit: 2649

Confirmation: 1847

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

AMENDMENT AND RESPONSE TO NON-FINAL OFFICE ACTION

In response to the Office Action mailed April 18, 2016, please enter the following amendment:

Listing of the Claims begins on page **2** of this paper.

Remarks/Arguments begin on page **17** of this paper.

Conclusion begins on page **21** of this paper.

CERTIFICATE OF ELECTRONIC FILING
I hereby certify that this paper is being transmitted to the U.S. Patent and Trademark Office via EFS Web on the date indicated below.

/Angela M. Quinn/ *August 18, 2016*
Angela M. Quinn Date

IN THE CLAIMS

A complete list of claims is presented below with amendments marked up:

1. – 64. (Cancelled)

65. (Currently Amended) A method for performing interference cancellation in a receiver, with a transmitter and the [a] receiver being co-located with each other, the method comprising:

generating intermodulation product (IMP) cancellation signals (ICSs) to cancel passive IMPs in the receiver, continuously and near real time, using copies of transmitter signals of the transmitter, wherein the passive IMPs are generated in passive transmitter components of the transmitter and receiver components of the receiver after a high powered amplifier (HPA) and transmitter filter of the transmitter, wherein the transmitter filter is coupled between the HPA and an antenna used by the transmitter, wherein generating the ICSs is based on a power series description of a non-linear process for generating the IMPs, and includes generating an n-th order ICS by, given three signals S1, S2 and S3, digitally multiplying and filtering S1 x S1 x S2 and S1 x S2 x S2 and S1 x S2 x S3 and S1 x S1 x S3 and S2 x S2 x S3 and S1 x S3 x S3 and S2 x S3 x S3, where n is an integer.

66. The method of claim 65, wherein the copies of the transmitter signals used in generating the ICSs are digital copies of the transmitter signals.

67. The method of claim 65, further comprising:

capturing transmitter signals as analog signals at a transmitter output; and

down-converting and sampling the captured transmitter signals to create the copies of transmitter signals used in generating the ICSs.

68. (Currently Amended) A method for cancelling passive intermodulation products (IMPs), comprising:

generating, with a priori knowledge of a transmitter signal set, continuous and real time IMP cancellation signals (ICSs) in a baseband digital signal set of a receiver co-located with a [the] transmitter based on the transmitter signal set, wherein digital copies of the transmitter signal set are passed to the receiver, the passive IMPs are generated in the transmitter and receiver chain after a high power amplifier (HPA) and transmitter filters of the transmitter, wherein the transmitter filters are coupled between the HPA and at least one antenna used by the transmitter, and wherein the transmitter filters are configured to significantly reduce active IMPs in band of a passband of the receiver, ~~passband~~ wherein generating the ICSs is based on a power series description of a non-linear process for generating the IMPs, and includes generating a 3rd order ICS by, given three signals S1, S2 and S3, digitally multiplying and filtering S1 x S1 x S2 and S1 x S2 x S2 and S1 x S2 x S3 and S1 x S1 x S3 and S2 x S2 x S3 and S1 x S3 x S3 and S2 x S3 x S3.

69. (Currently Amended) The method of claim 68, wherein ~~generating the ICSs is further based on a power series description of a non-linear process for generating the IMPs, and~~ the power series description of the non-linear process includes:

~~generating 3rd order ICSs by digitally multiplying two or three signals of the transmitter signal set;~~

generating 5th order ICSs by digitally multiplying two or three or five signals of the transmitter signal set;

generating 7th order ICSs by digitally multiplying two or three or five or seven signals of the transmitter signal set; and

~~generating odd order ICSs by digitally multiplying an odd number of digital signals, and~~ combining these digital signals with the received baseband digital signals to cancel the passive IMPs.

70. (Previously Presented) The method of claim 69, wherein the power series description of the non-linear process further includes generating even order ICSs by digitally multiplying an even number of the transmitter digital signals and combining these digital signals with the received baseband digital signals to cancel the passive IMPs, and wherein the receiver passband is far enough separated from the transmitter to have even order IMPs fall inband.

71. (Cancelled)

72. (Currently Amended) The method of claim 69, wherein generating the 5th order ICSs comprises:

given up to a set of 5 signals, S1, S2, S3, S4, and S5, digitally multiplying and filtering different combinations of up to the 5 signals~~, some duplicated~~.

73. (Currently Amended) The method of claim 69, wherein generating the 7th order ICSs comprises:

given up to a set of 7 signals, S1, S2, S3, S4, S5, S6,and S7, digitally multiplying and filtering different combinations of up to the 7 signals~~, some duplicated~~.

74. (Currently Amended) The method of claim 68 [69], wherein generating the odd order ICSs comprises:

digitally multiplying and filtering an odd number of digital signals, up to "n" in number, from the [a] transmitter signal set~~, some duplicated~~.

75. (Previously Presented) The method of claim 68, wherein generating the ICSs includes digital multiplication of the transmitter signals in a digital domain with a standard compression model of a nonlinear device model by convolving a composite transmitter signal set with a compression curve function.

76. (Previously Presented) The method of claim 68, wherein the receiver passband contains passive IMPs generated after the HPA and transmitter filters that fall inband of the receiver, and wherein the residual passive IMPs are detected and used to process a control signal back in the receiver to adjust a phase and amplitude of the digital ICSs to minimize the residual passive IMPs in the receiver.

77. (Previously Presented) The method of claim 68, wherein the ICSs are cross correlated with a signal of interest after passive IMP cancellation to adjust a phase and amplitude of the ICSs to minimize residual passive IMPs.

78. (Previously Presented) The method of claim 77, wherein a process function for adjusting the phase and amplitude of the ICSs is to utilize an adjustable finite impulse response filter (FIR).

79. (Previously Presented) The method of claim 77, wherein a process function for adjusting the phase and amplitude of the ICSs comprises two concatenated functions, one for phase control and one for amplitude control.

80. (Previously Presented) The method of claim 68, wherein the passive IMPs are cancelled in the co-located receiver by a digital process based on a power series description of the non-linear process in a transmitter hardware chain and is done with one or more ICSs in the receiver, and wherein the nonlinear power expansion is represented by a standard nonlinear amplitude control function or a compression curve.

81. (Currently Amended) A method comprising:

receiving a digital copy of a transmitter signal at a receiver, the receiver co-located with a transmitter that generates the transmitter signal; and

generating digital passive intermodulation product (IMP) cancellation signals (ICSs) to digitally, continuously and in real time, cancel passive IMPs falling within a

receiver passband, the passive IMPs being generated after a high powered amplifier (HPA) and a transmitter filter of the transmitter, wherein the transmitter filter is coupled between the HPA and an antenna used by the transmitter, wherein generating the ICSs is based on a power series description of a non-linear process for generating the IMPs, and includes generating an n-th order ICS by given three signals S1, S2 and S3, digitally multiplying and filtering S1 x S1 x S2 and S1 x S2 x S2 and S1 x S2 x S3 and S1 x S1 x S3 and S2 x S2 x S3 and S1 x S3 x S3 and S2 x S3 x S3, where n is an integer.

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82. (Currently Amended) A method comprising:

creating one or more composite passive intermodulation product (IMP) cancellation signals (ICSs) by digitally multiplying, sample by sample and in real and continuous time, a full passband of a composite digital transmitter signal set with one or more transmitter IMP cancellation signals (ICSs), wherein generating the ICSs is based on a power series description of a non-linear process for generating the IMPs, and includes generating an n-th order ICS by, given three signals S1, S2 and S3, digitally multiplying and filtering S1 x S1 x S2 and S1 x S2 x S2 and S1 x S2 x S3 and S1 x S1 x S3 and S2 x S2 x S3 and S1 x S3 x S3 and S2 x S3 x S3, where n is an integer; and

filtering the transmitter ICSs to selectively pass ICSs for passive IMP cancellation in a receiver, the receiver co-located with a transmitter, the passive IMP cancellation to cancel passive IMPs generated after a high powered amplifier (HPA) and a transmitter filter of the transmitter, wherein the transmitter filter is coupled between the HPA and an antenna used by the transmitter.

83. (Previously Presented) The method of claim 82, wherein source signals that create the passive IMPs are digitally combined into a combined signal, and the combined signal is convolved with a standard nonlinear compression curve to create the ICSs.

84. (Previously Presented) The method of claim 82, wherein individual digital baseband ICSs are each individually adjusted in phase and amplitude to minimize a cross correlation between residual passive IMPs generated in analog transmitter components, and wherein the ICSs are further generated from a selected set of signals from the composite digital transmitter signal set.

85. (Previously Presented) The method of claim 84, wherein in the ICSs are converted to analog signals and used to cancel passive IMPs in the analog domain.

86. (Currently Amended) An apparatus comprising:

a transmitter;

a receiver co-located with the transmitter; and

circuitry to perform interference cancellation in the receiver, the circuitry configured to:

generate intermodulation product (IMP) cancellation signals (ICSs) to cancel passive IMPs in the receiver, continuously and near real time, using copies of transmitter signals, wherein the passive IMPs are generated in passive transmitter and receiver components after a high powered amplifier (HPA) and

transmitter filter, wherein the transmitter filter is coupled between the HPA and an antenna used by the transmitter, wherein the circuitry is further configured to generate the ICSs based on a power series description of a non-linear process for generating the IMPs, and is operable to generate an n-th order ICS by, given three signals S1, S2 and S3, digitally multiplying and filtering S1 x S1 x S2 and S1 x S2 x S2 and S1 x S2 x S3 and S1 x S1 x S3 and S2 x S2 x S3 and S1 x S3 x S3 and S2 x S3 x S3, where n is an integer.

87. (Previously Presented) The apparatus of claim 86, wherein the copies of the transmitter signals used in generating the ICSs are digital copies of the transmitter signals.

88. (Previously Presented) The apparatus of claim 86, wherein the circuitry is further configured to:

capture transmitter signals as analog signals at a transmitter output; and

down-convert and sample the captured transmitter signals to create the copies of transmitter signals used in generating the ICSs.

89. (Currently Amended) An apparatus comprising:

a transmitter;

a receiver co-located with the transmitter; and

circuitry to cancel passive intermodulation products (IMPs) in the co-located receiver, the circuitry configured to:

generate, with a priori knowledge of a transmitter signal set, continuous and real time IMP cancellation signals (ICSs) in a baseband digital signal set of the co-located receiver based on the transmitter signal set, wherein digital copies of the transmitter signal set are passed to the receiver, the passive IMPs are generated in the transmitter and receiver chain after a high power amplifier (HPA) and transmitter filters, wherein the transmitter filters are coupled between the HPA and at least one antenna used by the transmitter, and the transmitter filters are configured to significantly reduce active IMPs in band of a passband of the receiver ~~passband~~, wherein the circuitry is further configured to generate the ICSs based on a power series description of a non-linear process for generating the IMPs, and the circuitry is operable to generate a 3rd order ICS by, given three signals S1, S2 and S3, digitally multiplying and filtering S1 x S1 x S2 and S1 x S2 x S2 and S1 x S2 x S3 and S1 x S1 x S3 and S2 x S2 x S3 and S1 x S3 x S3 and S2 x S3 x S3.

90. (Currently Amended) The apparatus of claim 89, wherein ~~the circuitry is further configured to generate the ICSs based on a power series description of a non-linear process for generating the IMPs, and~~ the power series description of the non-linear process includes:

~~generating 3rd order ICSs by digitally multiplying two or three signals of the transmitter signal set;~~

generating 5th order ICSs by digitally multiplying two or three or five signals of the transmitter signal set;

generating 7th order ICSs by digitally multiplying two or three or five or seven signals of the transmitter signal set; and

~~generating odd order ICSs by digitally multiplying an odd number of digital signals, and~~ combining these digital signals with the received baseband digital signals to cancel the passive IMPs.

91. (Previously Presented) The apparatus of claim 90, wherein the power series description of the non-linear process further includes generating even order ICSs by digitally multiplying an even number of the transmitter digital signals and combining these digital signals with the received baseband digital signals to cancel the passive IMPs, wherein the receiver passband is far enough separated from the transmitter to have even order IMPs fall inband.

92. (Cancelled)

93. (Currently Amended) The apparatus of claim 90, wherein, given up to a set of 5 signals, S1, S2, S3, S4, and S5, the circuitry is further configured to:

generate the 5th order ICSs by digitally multiplying and filtering different combinations of up to <u>the</u> 5 signals~~, some duplicated~~.

94. (Currently Amended) The apparatus of claim 90, wherein, given up to a set of 7 signals, S1, S2, S3, S4, S5, S6,and S7, the circuitry is further configured to:

generate the 7th order ICSs by digitally multiplying and filtering different combinations of up to the 7 signals~~, some duplicated,~~ to selectively create the 7th order ICSs.

95. (Currently Amended) The apparatus of claim 88 [90], wherein the circuitry is further configured to:

generate the odd order ICSs by digitally multiplying an odd number of digital signals, up to "n" in number, from the [a] transmitter signal set~~, some duplicated~~; and

filter the results to selectively create nth odd order active ICSs.

96. (Previously Presented) The apparatus of claim 89, wherein the circuitry is further configured to:

generate the ICSs via digital multiplication of the transmitter signals in a digital domain with a standard compression model of a nonlinear device model by convolving a composite transmitter signal set with a compression curve function.

97. (Previously Presented) The apparatus of claim 89, wherein the receiver passband contains passive IMPs generated after the HPA and transmitter filters that fall inband of the receiver, and wherein the residual passive IMPs are detected and used to process a control signal back in the receiver to adjust a phase and amplitude of the digital ICSs to minimize the residual passive IMPs in the receiver.

98. (Previously Presented) The apparatus of claim 89, wherein the circuitry is further configured to:

cross correlate ICSs with a signal of interest after passive IMP cancellation to adjust a phase and amplitude of the ICSs to minimize residual passive IMPs.

99. (Previously Presented) The apparatus of claim 98, further comprising:

a finite impulse response filter (FIR) to adjust the phase and amplitude of the ICSs.

100. (Previously Presented) The apparatus of claim 98, wherein a process function for adjusting the phase and amplitude of the ICSs comprises two concatenated functions, one for phase control and one for amplitude control.

101. (Previously Presented) The apparatus of claim 89, wherein the passive IMPs are cancelled in the co-located receiver by a digital process based on a power series description of the non-linear process in a transmitter hardware chain and is done with one or more ICSs in the receiver, and wherein the nonlinear power expansion is represented by a standard nonlinear amplitude control function or a compression curve.

102. (Currently Amended) An apparatus comprising:

a transmitter;

a co-located receiver; and

circuitry configured to:

receive a digital copy of a transmitter signal at the co-located receiver; and

generate digital passive intermodulation product (IMP) cancellation signals (ICSs) to digitally, continuously and in real time, cancel passive IMPs falling within a receiver passband, the passive IMPs being generated after a high powered amplifier (HPA) and a transmitter filter of the transmitter, wherein the transmitter filter is coupled between the HPA and an antenna used by the transmitter, wherein the ICSs are generated based on a power series description of a non-linear process for generating the IMPs, and an n-th order ICS is generated by, given three signals S1, S2 and S3, digitally multiplying and filtering S1 x S1 x S2 and S1 x S2 x S2 and S1 x S2 x S3 and S1 x S1 x S3 and S2 x S2 x S3 and S1 x S3 x S3 and S2 x S3 x S3, where n is an integer.

103. (Currently Amended) An apparatus comprising:

a transmitter;

a receiver co-located with the transmitter; and

circuitry configured to:

create one or more composite passive intermodulation product (IMP) cancellation signals (ICSs) by digitally multiplying, sample by sample and in real and continuous time, a full passband of a composite digital transmitter signal set with one or more transmitter IMP cancellation signals (ICSs), wherein the ICSs are generated based on a power series description of a non-linear process for generating the IMPs, and a 3rd order ICS is generated by, given three signals S1,

S2 and S3, digitally multiplying and filtering S1 x S1 x S2 and S1 x S2 x S2 and S1 x S2 x S3 and S1 x S1 x S3 and S2 x S2 x S3 and S1 x S3 x S3 and S2 x S3 x S3; and

filter the transmitter ICSs to selectively pass ICSs for passive IMP cancellation in a co-located receiver, the passive IMP cancellation to cancel passive IMPs generated after a high powered amplifier (HPA) and a transmitter filter of the transmitter, wherein the transmitter filter is coupled between the HPA and an antenna used by the transmitter.

104. (Previously Presented) The apparatus of claim 103, wherein the circuitry is further configured to:

digitally combine source signals that create the passive IMPs into a combined signal, wherein the combined signal is convolved with a standard nonlinear compression curve to create the ICSs.

105. (Previously Presented) The apparatus of claim 103, wherein the circuitry is further configured to:

individually adjust, in phase and amplitude, each digital baseband ICSs to minimize a cross correlation between residual passive IMPs generated in analog transmitter components, wherein the ICSs are further generated from a selected set of signals from the composite digital transmitter signal set.

106. (Previously Presented) The apparatus of claim 105, wherein the circuitry is further configured to:

convert the ICSs back to analog; and

cancel the passive IMPs in the analog domain with the converted ICSs.

REMARKS

Applicants respectfully request reconsideration of this application. Claims 65-106 are pending. Claims 65, 68, 69, 72-74, 81, 82, 86, 89, 90, 93-95, 102 and 103 have been amended. Claims 71 and 92 have been canceled. No claims have been added.

The Examiner rejected Claims 65-80 and 89-101 under 35 U.S.C. §102(a) or 35 U.S.C. §112. Applicants have amended Claims 65, 68, 69, 72-74, 81, 82, 86, 89, 90, 93-95, 102 and 103 to set forth the claimed invention in clear and concise language. In view of the amendments, Applicants respectfully submits that the amendments overcome the rejection.

The Examiner indicated Claims 71 and 92 would be allowable if rewritten to overcome the rejections under 35 U.S.C. §102(a) or 35 U.S.C. §112. Claim 71 is dependent indirectly on Claim 68, and Claim 92 is dependent indirectly on Claim 89. Applicant has amended Claims 68 and 89 to include substantially all the limitations of Claims 71 and 92, respectively, and some of the limitations of their intervening claims. Applicants respectfully submit that in view of the amendments Claims 68 and 89, and their dependent claims, are in condition for allowance.

Applicants have also amended Claim 103 to include substantially the same amendment added to Claims 68 and 89. Therefore, for the same reasons, Applicants respectfully submit that Claim 103, and its dependent claims, are in condition for allowance.

The Examiner also rejected Claims 65-106 under 35 U.S.C. §103(a) as being unpatentable over U.S. Patent No. 7,876,867 of Filipovic et al. (hereinafter "Filipovic")

(U.S. Patent No. 7,876,867) in view of Lackey (US Pub. No. 2010/0136925) and Dent (U.S. Patent No. 8,855,580). Applicant respectfully disagrees.

Claim 65 as amended comprises:

> A method for performing interference cancellation in a receiver, with a transmitter and the receiver being co-located with each other, the method comprising:
> generating intermodulation product (IMP) cancellation signals (ICSs) to cancel passive IMPs in the receiver, continuously and near real time, using copies of transmitter signals of the transmitter, wherein the passive IMPs are generated in passive transmitter components of the transmitter and receiver components of the receiver after a high powered amplifier (HPA) and transmitter filter of the transmitter, wherein the transmitter filter is coupled between the HPA and an antenna used by the transmitter, wherein generating the ICSs is based on a power series description of a non-linear process for generating the IMPs, and includes generating an n-th order ICS by, given three signals S1, S2 and S3, digitally multiplying and filtering S1 x S1 x S2 and S1 x S2 x S2 and S1 x S2 x S3 and S1 x S1 x S3 and S2 x S2 x S3 and S1 x S3 x S3 and S2 x S3 x S3, where n is an integer. (emphasis added)

As set forth above, Claim 65 requires generating IMP cancellation signals to cancel passive IMPs generated after a filter of a transmitter using copies of transmitter signals from the transmitter, where generating the ICSs is based on a power series description of a non-linear process for generating the IMPs, and includes generating an n-th order ICS by, given three signals S1, S2 and S3, digitally multiplying and filtering S1 x S1 x S2 and S1 x S2 x S2 and S1 x S2 x S3 and S1 x S1 x S3 and S2 x S2 x S3 and S1 x S3 x S3 and S2 x S3 x S3, where n is an integer. Applicant respectfully submits that one skilled in the art would not combine Filipovic, Lackey, and Dent to arrive at the present invention as claimed.

More specifically, Filipovic discloses an intermodulation distortion detection and mitigation technique. As shown in Figures 3, 4A, 4B and 7, which were cited by the

Examiner, a "transmit leakage signal" is generated from the power amplifier in the transmit path prior to a duplexer. This is an active IMP, not a passive IMP. Thus, Filipovic is limited to mitigating active IMPs that are generated in the power amplifier and prior to transmitter filters. The sections cited by the examiner, namely column 1, line 53 - column 2, line 18 and column 14, lines 15-25 do not mention or involve passive IMPs. In fact, passive IMPs are not discussed in Filipovic. The passive IMPs are generated in the transmitter chain from the output of the filters to the output of the antennas. For one example source, when there are any discontinuities or oxidation of components after the transmit filters, passive IMPs are created. There is no disclosure of cancelling passive IMPs that occur beyond the duplexer, or any transmit filter. As such, no techniques disclosed in Filipovic will mitigate passive IMPs that fall in the passband of the co-located receiver because the passive IMPs are generated after the transmitter filters.

Futhermore, Filipovic does not disclose generating an n-th order ICS by, given three signals S1, S2 and S3, digitally multiplying and filtering S1 x S1 x S2 and S1 x S2 x S2 and S1 x S2 x S3 and S1 x S1 x S3 and S2 x S2 x S3 and S1 x S3 x S3 and S2 x S3 x S3, where n is an integer.

The Examiner stated that Filipovic did not point out passive IMPs. Therefore, the Examiner cited Lackey, and in particular, paragraphs 3-8 of the background section and Figure 1A, including transmission signal 40. Figures 3-8 of the background section of Lackey disclose interfering signals and generating interference cancellation signals. However, there is no disclosure of generating intermodulation product (IMP) cancellation signals (ICSs) for cancelling IMPs generated in passive transmitter components of the

transmitter and receiver components of the receiver after a high powered amplifier (HPA) and transmitter filter of the transmitter in order using copies of transmitter signals of the transmitter. Furthermore, Figure 1A discloses a cancellation circuit with an adaptively tuned slope control. However, with respect to Figure 1A, there is no generating intermodulation product (IMP) cancellation signals (ICSs) for cancelling IMPs generated in passive transmitter components of the transmitter and receiver components of the receiver after a high powered amplifier (HPA) and transmitter filter of the transmitter in order using copies of transmitter signals of the transmitter.

As in the case of Filipovic, Lachey also does not disclose generating an n-th order ICS by, given three signals S1, S2 and S3, digitally multiplying and filtering S1 x S1 x S2 and S1 x S2 x S2 and S1 x S2 x S3 and S1 x S1 x S3 and S2 x S2 x S3 and S1 x S3 x S3 and S2 x S3 x S3, where n is an integer.

Dent doesn't overcome the deficiencies of Filipovic and Lackey as Dent does not disclose passive IMPs and their cancellation. The leakage signal of Dent causes active IMPS, not passive IMPs.

In view of this, Applicant respectfully submits that the present invention as claimed in Claim 65 and its dependent claims are not obvious in view of Filipovic, Lackey and Dent.

Claims 81, 82, 86 and 102 includes limitations that are substantially similar to those limitations discussed above with respect to Claim 65. Therefore, for the same reasons discussed above with respect to Claim 65, Applicants respectfully submit that Claims 81, 82, 86 and 102, along with their dependent claims, are in condition for allowance.

CONCLUSION

Pursuant to 37 C.F.R. §1.136(a)(3), Applicants hereby request and authorize the U.S. Patent and Trademark Office to (1) treat any concurrent or future reply that requires a petition for extension of time as incorporating a petition for extension of time for the appropriate length of time and (2) charge all required fees, including extension of time fees and fees under 37 C.F.R. 1.16 and 1.17, to Deposit Account No. 02-2666.

Respectfully submitted,
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